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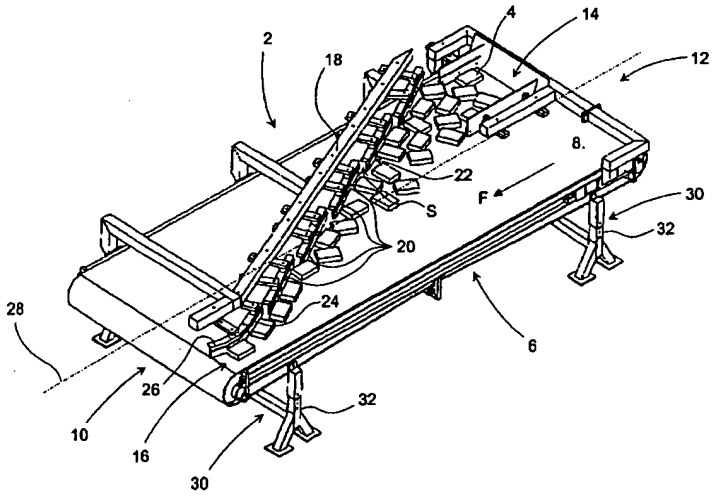
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(54) Title: SORTING PLANT FOR SORTING ITEMS FED IN BULK



(57) Abstract: In connection with making cast paving bricks (4) of concrete with rectangular basic shape, sometimes there is performed a finishing treatment of the bricks by "rumbling" where the bricks otherwise organised on pallets or a casting board are transferred to a cylindric drum where these are tumbled with the purpose of achieving a surface with particular appearance. It has appeared that rumbled bricks, for price reasons, are preferred to be delivered in bulk, as a subsequent manually performed palletising is a relatively expensive element. Thus there is indicated a sorting unit (2) including a conveyor (6) with a conveyor belt (8) over the surface of which, between a receiving area (14) for the bricks (4) and a delivery area (16), there are mutually spaced guide bars (20) disposed obliquely in relation to the direction of movement (F) of the conveyor, by which the bricks (4) are guided in a row with the same orientation for subsequent palletising by machine.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Sorting Plant for Sorting Items Fed in Bulk

The present invention concerns a sorting unit for sorting items supplied to the sorting unit in bulk, preferably paving bricks with rectangular basic shape.

The need for special sorting units arises in particular in connection with production facilities for cast paving bricks, where the cast items are subjected to finishing treatment before transporting to stock or to the end user. Under normal circumstances, such cast block bricks may be laid out on the casting board in formation where they may palletised relatively easily after drying without any sorting in advance.

Certain types of paving brick are, however, after hardening of the concrete are subjected to finishing treatment in the form of "rumbling", where the bricks otherwise arrayed on the casting board are transferred to a cylindric rotating drum, and the bricks are applied a kind of mellowness in that they are bumping against each other during the tumbling/rolling, whereby the edges of the brick are slightly blurred, and the surface is imparted a special, slightly worn appearance.

After the above treatment, the said paving bricks will be led out from the drum and are subsequently found in bulk, i.e. in a pile without any special arrangement of the bricks. In some cases, one has subsequently performed palletising of the bricks which is a particularly costly work, as individual bricks are to be handled manually and be laid upon a pallet, inferring that the price for rumbled bricks arranged on pallets is considerably greater than for similar bricks delivered in bulk. The advantage of delivering the bricks on pallets is that these are more easily handled/laid out than if they are only delivered in bulk, where they e.g. are tilted off a lorry upon the ground in a pile, from which they are transported/handled manually to the final laying site.

The need for rumbled paving bricks of concrete laid on pallets before delivery is thus great, but until now the purchasers of said types of paving bricks have refrained from having these delivered in palletised condition to a greater extent due to the somewhat higher delivery price for said bricks. Furthermore, it is to be noted that for the pro-

ducer/wholesaler of the paving bricks delivered in bulk, it may sometimes be difficult to determine the accurate number of bricks delivered in connection with orders of a given number of square meters when the brick are in bulk. On the part of the producer/provider it is also necessary to be able to deliver the paving bricks in palletised condition.

By the invention it has been realised that it will be possible to perform organising of paving bricks of the indicated king in a guided row by a sorting unit being characterised in that sorting unit includes a plane conveyor with a largely horizontally running conveyor with a front end and a rear end, where the rear end includes a receiving area for supplying items in bulk which are laid on the conveyor belt, and where from the receiving area and to a delivery area at the front end of the conveyor at a level above the conveyor belt there is a horizontal support beam obliquely oriented in relation to the conveying direction of the conveyor, including a plurality of downwards projecting, mutually spaced guide bars that are displaced in parallel and with inclination relative to the beam, with a front side oriented against the direction of conveying of the conveyor, and where the undersides of the bars extend substantially in parallel with and immediately over the surface of the conveyor belt.

The effect of the sorting unit is surprising since it appears that the paving bricks with rectangular basic shape by supplying in the receiving area are evenly distributed on the conveyor belt and are moved against the inclining guide bars, initially with an arbitrary side edge sliding against the front side of the guide bars. The spacings between the guide bars, however, provide that the paving bricks at the latest, before they reach the delivery area, are guided so that their longest side edge is running in parallel with the front sides of the guide bars.

With the purpose of delivering the now arrayed paving bricks into a straight row in the delivery area for further organising in a palletising facility, the guide bar in the delivery area may be rounded so that its free end is oriented with inclination towards the centre axis of the conveyor.

With the purpose of ensuring an efficient and rapidly effected organising of the supplied paving bricks, the front sides of the guide bars can be provided with a friction inducing surface coating. Hereby may be achieved that the paving bricks are relatively quickly/early in their course through the sorting unit guided as described above. The surface coating furthermore serves the purpose of protecting the guide bars against wear.

Depending on the size and weight of the brick type processed in the sorting unit, it will sometimes be necessary to perform a change in the inclination of the support beam in relation to the conveying direction of the conveyor, which is made possible by the support beam being mounted adjustable on the sorting unit. The same is the case with regard to the width of the delivery area, as indicated in claim 5, and sometimes it will also be necesary to perform a change in inclination of the guide bars relative to the support beam, which is possible by the guide bars being mounted so that they are adjustable.

Depending on the size and weight of the bricks, the spacings between respective guide bars may be of great significance for the desired organising of the paving bricks being sliding against the front side of the guide bars. This spacing between the guide bars can thus be adjustable, cf. Fig. 7.

In connection with supplying the paving bricks in bulk, their order is arbitrary. In order that the paving bricks are placed upon their largest surfaces, it may sometimes be advantageous that the conveyor/transporting unit inclines slightly, typically so that the course of the belts between the supply area and the delivery area is slightly rising. This inclination is dependent on the size of the bricks and of the speed with which the belts are conveyed in the direction of movement. With the purpose of making the sorting unit as flexible as possible, it may thus be provided on an underframe having legs that are adjustable. Hereby is achieved a reasonably large liberty with regard to the inclination of the conveyor.

In connection with organising the said paving bricks prior to palletising, a quality test

is performed before the paving bricks are leaving the sorting unit, the test typically being performed manually by a person situated in the sorting area who is sorting off/removes the paving bricks that are damaged and unsuited for use. With the intention that the work can be performed with some certainty regarding the quality, a suitable conveying speed for the conveyor belt will be in the area 0.8 to 1.6 m/s, typically in the range 1.0 - 1.4 m/s, and preferably with the range 1.1 - 1.3 m/s. The precise speed to be preferred will depend on the brick size processed in the sorting unit, why the sorting unit will furthermore be provided with means for stepless regulation of the belt speed as indicated in claim 10.

The invention will be explained in more detail in the following with reference to the drawing, where:

Fig. 1 is perspective view of a sorting unit according to the invention as seen obliquely from above,

Fig. 2 is a top view of the sorting unit shown in Fig. 1, and

Fig. 3 is a side view of the sorting unit shown in Figs. 1 and 2.

The sorting unit 2 shown in Fig. 1 is supplied paving bricks 4 in bulk and includes a conveyor 6 with a largely horizontally running conveyor belt 8 with a front end 10 and a rear end 12, where the rear end 12 includes a receiving area 14 for the supply of said items in bulk which are laid upon the conveyor belt. The sorting unit 2 furthermore includes a delivery area 16 at the front end 10, and between the receiving area 14 and the delivery area 16 there is provided a support beam 18 oriented obliquely in relation to the moving direction F of the conveyor, including a plurality of downwards projecting guide bars 20 that are mutually spaced apart, displaced in parallel and inclining relative to the beam 19 and having a front side 22 oriented against the direction of conveying F of the conveyor. The undersides of the guide bars are extending substantially in parallel with and immediately above the surface of the conveyor belt 8.

On the support beam 18, there is a guide bar 24 in the delivery area 16 which is rounded and the free end 26 of which is finished oriented inclining towards the centre

axis 28 of the conveyor.

The front side 22 of the guide bars is furthermore provided with friction inducing surface coating 30 which furthermore serves to protect the guide bars against wear from the brick items sorted in the sorting unit.

The sorting unit has the following mode of operation: The conveyor is started with the belt running in direction F, and paving bricks with rectangular basic shape are supplied to the receiving area 14, whereby they are moved against the inclining guide bars by the movement of the conveyor, whereby the bricks are guided so that at least one of their sides is extending in parallel with and in contact with a front side 22 of one of the guide bars 20.

The guide bars are, as it appears from Figs. 1 and 2, evenly distributed along the support beam 18 and with an oblique course in relation to the direction of movement F of the conveyor which is deviating from the inclining orientation of the support beam 18. The front sides of the guide bars are mainly oriented in parallel, but the individual guide bars are staggered in parallel relative to each other, which means that the paving bricks are turned during their displacement in parallel with the front side faces 22 of the guide bars 18 so that they, before they are coming in abutment against the guide bar 24 in the delivery area, will be oriented with one long side of the rectangular basic shape in parallel with and in contact with a front side face 22 on the guide bars 20.

In the delivery area, the paving bricks will thus pass arrayed with the bricks in a row and oriented the same way, and it will here be possible to perform a manual sorting of the paving bricks 4 that are not fulfilling the quality requirements applicable for a delivery of this type of bricks.

As further appearing from Figs. 1 and 3, the conveyor 6 is disposed on an underframe 30 with longitudinally adjustable legs. The purpose with this is that sometimes it will be desirable that the conveyor 6 has a slightly rising course between the receiving area 14 and the delivery area 16 which will cause supplied brick items disposed standing

on a side edge or an end edge are more liable to tilt so that they come to lie on their largest surface in order that these can be guided into a row as mentioned above.

It is preferred that the support beam 18 as well as the guide bars 20, 24 are mounted so that they are adjustable with regard to the angle V they are forming with the centre axis 28 of the conveyor.

The guide bar 24 in the delivery area 16 is also adjustable with regard to the aforesaid angle and furthermore adjustable in the lateral direction of the conveyor with the purpose of adjusting the width B of the delivery area 16.

The speed of the conveyor belt 8 is steplessly adjustable by known measures within an interval in the range 0.8 – 1.6 m/s. Practical experiments in connection with using the sorting unit for arraying the commonly occurring paving bricks with rectangular basic shape have shown that a preferred speed is within the range 1.1 – 1.3 m/s, and typically 1.2 m/s. With this speed is also achieved a rather secure manual quality control and sorting off of unsuited items from the paving bricks guided into a row.

Finally, it is to be noted that, probably in connection with sorting/organising other kinds of rectangular items, such as fruit cans in the consumption industry, there are sorting units that guide the said units into rows in connection with packing etc.

It is to be underlined that the invention is of considerable importance within the field concerned which includes production of the rumbled paving brick that is palletised subsequently, before these are brought to the end user. After the said paving bricks have been guided into an array in the sorting unit according to the invention, it will be relatively simple to perform guiding into paths and dividing these paths into formations of the bricks, which in a relatively simple way may be laid up on a pallet.

Reference number list:

2:	sorting unit
4:	items (paving bricks)
6:	conveyor
8:	conveyor belt
10:	front end of conveyor belt
12:	rear end of conveyor belt
14:	receiving area
16:	delivery area
18:	support beam
20:	guide bars
22:	front side of guide bars
24:	guide bar in delivery area (16)
26:	free end of (24)
28:	centre axis of conveyor
30:	underframe of (6)
32:	longitudinally adjustable legs on (30)
B:	width of delivery area (16)
F:	direction of movement of conveyor
S:	spacing between guide bars (20)

CLAIMS

1. Sorting unit (2) for sorting items (4) in bulk, preferably paving bricks with rectangular basic shape, **characterised in that** the sorting unit (2) includes a plane conveyor (6) with a largely horizontally running conveyor (8) with a front end (10) and a rear end (12), where the rear end (12) includes a receiving area (14) for supplying items (4) in bulk which are laid on the conveyor belt (8), and where from the receiving area (14) and to a delivery area (16) at the front end (10) of the conveyor at a level above the conveyor belt (8) there is a horizontal support beam (18) obliquely oriented in relation to the conveying direction (F) of the conveyor, including a plurality of downwards projecting, mutually spaced guide bars (20) that are displaced in parallel and with inclination relative to the beam (18), with a front side (22) oriented against the direction of conveying (F) of the conveyor, and where the undersides of the bars extend substantially in parallel with and immediately over the surface of the conveyor belt (8).

2. Sorting unit (2) according to claim 1, **characterised in that** the guide bar (24) in the delivery area (16) is rounded, and that its free end (26) is finished with inclining orientation towards the centre axis (28) of the conveyor belt.

3. Sorting unit (2) according to claims 1 or 2, **characterised in that** front sides (22) of the guide bars are provided with a friction inducing surface coating (30).

4. Sorting unit (2) according to any of claims 1 – 3, **characterised in that** the inclination of the support beam (18) relative to the conveying direction (F) of the conveyor is adjustable.

5. Sorting unit (2) according to any of claims 1 – 4, **characterised in that** the width (B) of the delivery area (16) is adjustable.

6. Sorting unit (2) according to any of claims 1 – 5, **characterised in that** by the inclination (V) of the guide bars (20) relative to the centre axis (28) of the conveyor is adjustable.

7. Sorting unit (2) according to any of claims 1 – 6, **characterised in that** the spacing (S) between the guide bars (20) is adjustable.

8. Sorting unit (2) according to any of claims 1 – 7, **characterised in that** that the conveyor (6) is disposed on an underframe (30) having legs (32) that are longitudinally adjustable.

9. Sorting unit (2) according to any of claims 1 – 8, **characterised in that** the conveying speed of the conveyor belt (8) is in the range 0.8 to 1.6 m/s, typically within the range 1.0-1.4 m/s, and preferably within the range 1.1 – 1.3 m/s.

10. Sorting unit (2) according to any of claims 1 – 9, **characterised in that** conveying speed for the conveyor belt (8) on the conveyor (6) is steplessly variable by known means within a conveying speed in the range 0.8 – 1.6 m/s.

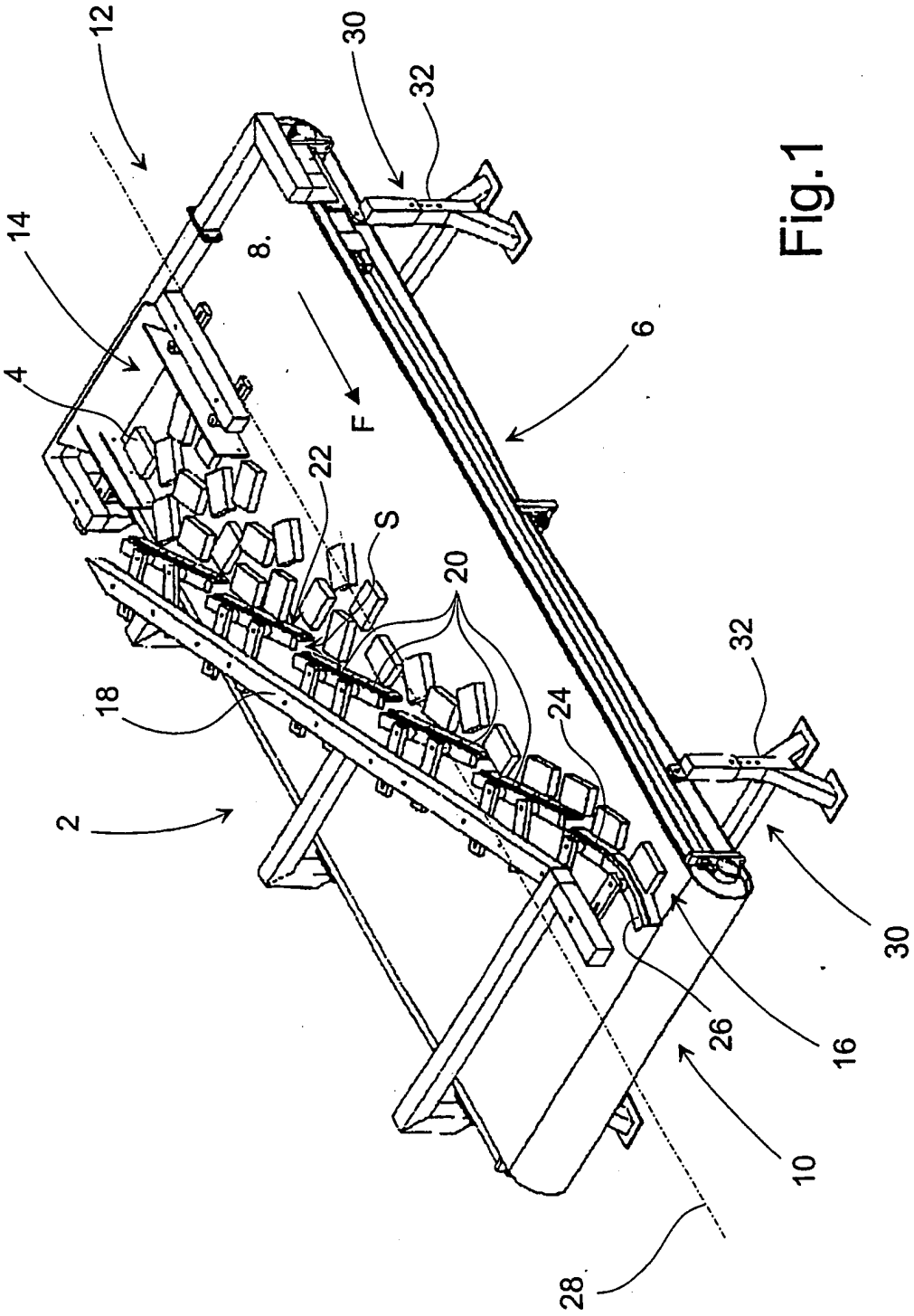


Fig.1

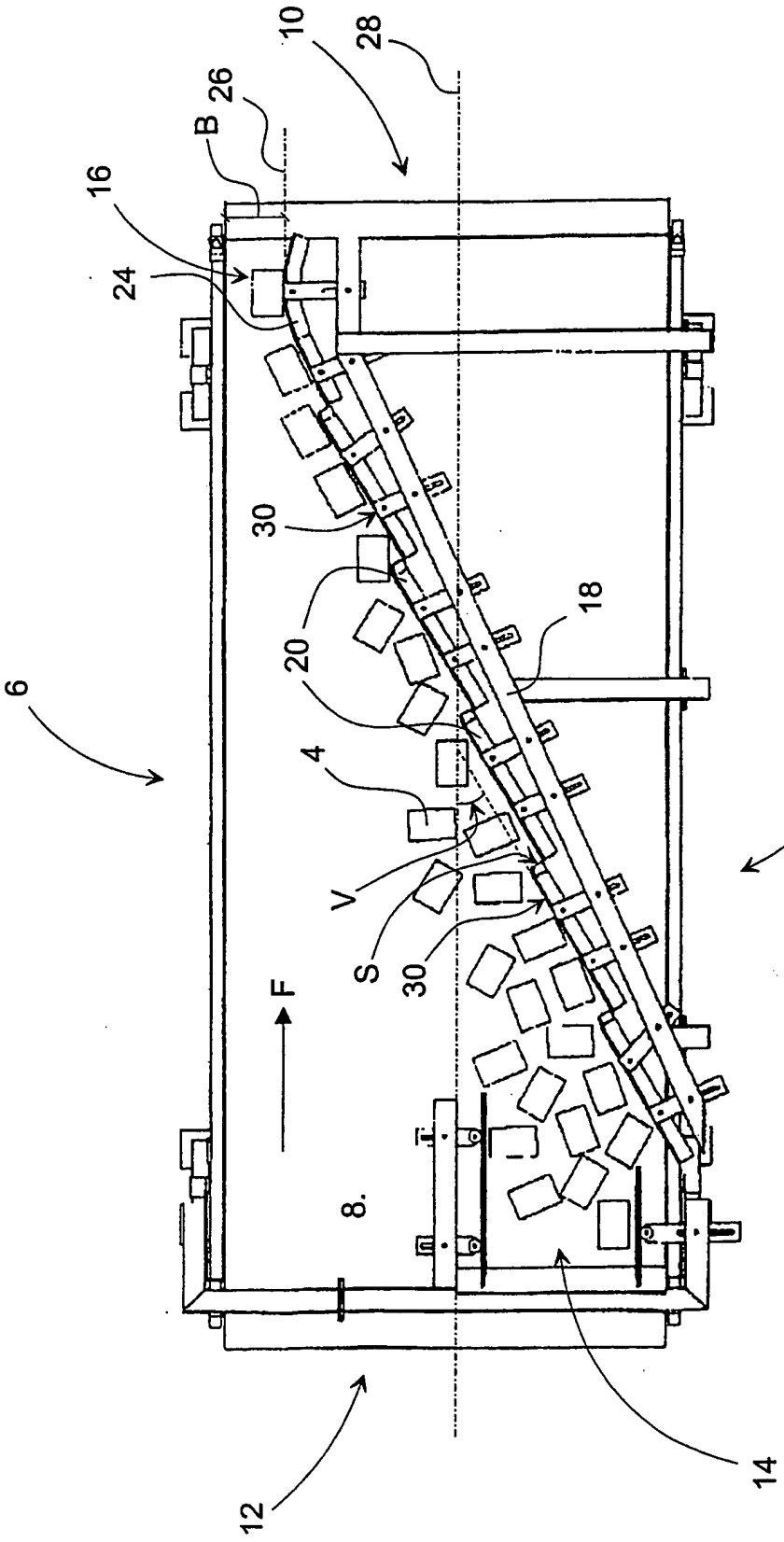


Fig.2

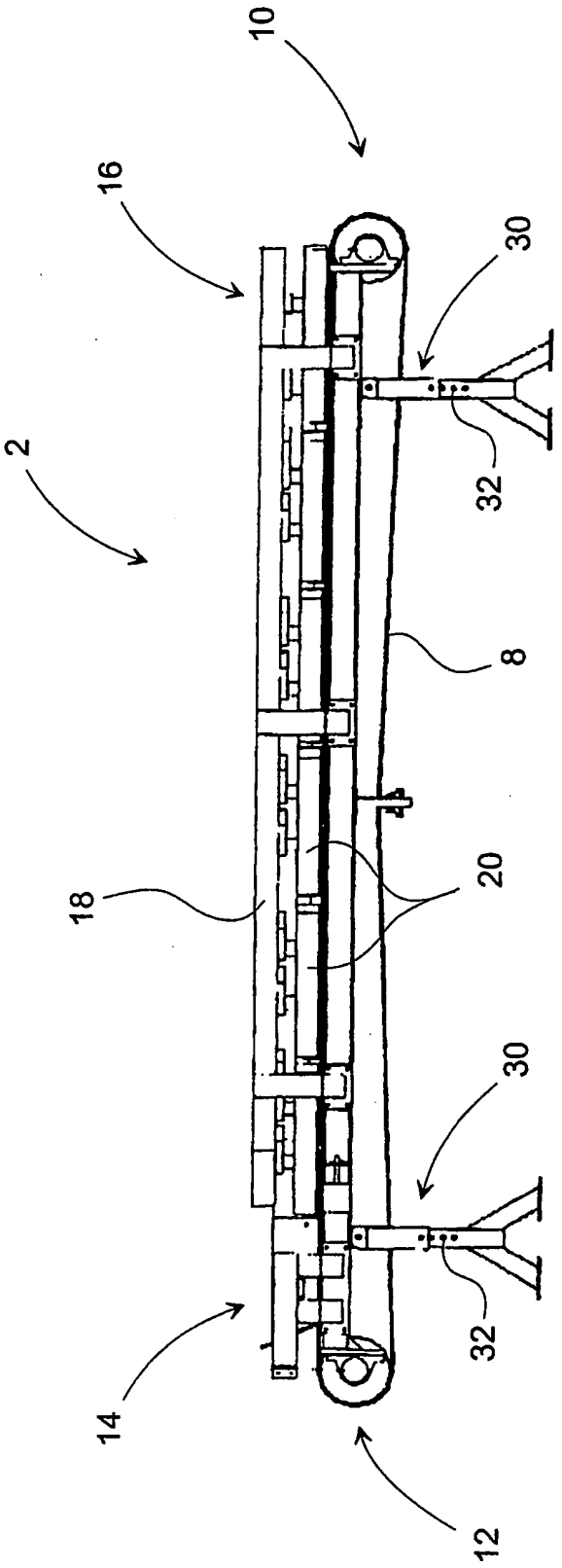


Fig.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 02/00714

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B07C 1/06, B65G 47/24 // B07B 5/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B07C, B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, PAJ, EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3866739 A (THADDEUS JOHN SIKORSKI), 18 February 1975 (18.02.75), claims; figures; abstract --	1
A	US 4889224 A (STANLEY D. DENKER), 26 December 1989 (26.12.89), abstract --	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 February 2003	20 -02- 2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Ulf Nyström/MP Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/DK 02/00714

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3866739 A	18/02/75	CA 987257 A	13/04/76
US 4889224 A	26/12/89	CA 2007193 A,C	27/09/90